1125-VP-1982 **Farzana Nasrin*** (farzana.nasrin@ttu.edu), Department of Mathematics and Statistics, Texas Tech University, 2500 Broadway, Lubbock, TX 79409, **Ram Iyer** (ram.iyer@ttu.edu), Department of Mathematics and Statistics, Texas Tech University, 2500 Broadway, Lubbock, TX 79409, **Eltonzsee See**, Department of Mathematics and Statistics, Texas Tech University, 2500 Broadway, Lubbock, TX 79409, and **Steven Mathews**, West Texas Eye Associates, Lubbock, TX 79424. *Smoothing Splines on Unit Ball Domains with Application to Corneal Topography.*

The increased prevalence of refractive surgery and design of customized contact lens with aspherical back surface necessitates a precise understanding of corneal topography. Slit-scanning elevation topographer (Orbscan II), Scheimpflug imager (Pentacam, Sirius), and optical coherence tomographers (Visante) are non-invasive imaging techniques used to study and understand structures of biological tissues such as corneal topographical elevation. An interesting and important problem is the reconstruction of the shape of the biological tissue from these images. A similar problem arises in Magnetic Resonance Imaging (MRI). We cast the problem as a penalized weighted least squares regression with a penalty on the magnitude of the Laplacian of the surface. We present a novel algorithm to construct the Kimeldorf-Wahba solution for unit ball domains. The solution is the sum of a harmonic function that provides a global fit and a linear combination of asymmetric radial basis functions that provide the local fit. Application of the theory to data from an anterior segment optical coherence tomographer is presented along with computation of simultaneous 95% confidence and prediction bands. A detailed comparison of the reconstructed surface using different approaches is also presented. (Received September 19, 2016)